

# OBSERVATIONS ON THE BIOLOGY OF SOME SOUTH INDIAN COCCIDS.

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(With 4 plates).

The insect group Coccidae constitutes one of the largest and most important families of Homopterous bugs, and from the economic point of view this family is one of the most important groups of insects which man has to deal with.

With the idea of supplementing our knowledge of the species of this group found in South India, an attempt is made in this paper to give descriptive accounts and life-histories of three species, one of which is recorded for the first time from India. The results of the studies embodied in this paper are based mainly on the material collected by the writer during his stay as a research student in the laboratory of the Government Entomologist, Agricultural College, Coimbatore, during the year 1934.

## *Pulvinaria durantae*, var. nov?

(Plate I; figures 1 to 11).

Ayyar (1936) recorded this new variety for the first time from India on the roots of cultivated *Amaranthus* plants in and around the Agricultural College Estate, Coimbatore.

On plants which are badly infested with this scale, almost all the different stages of the insect can be found at any time. The attacked plants have a sickly appearance, with the foliage faded and drying up. In fact these insects were revealed when such withered plants were pulled out.

Adult female: The mature female measures 2.86 mm. in length (average of 6 adults) and 2.4 mm. in breadth at the broadest region, which is very near the posterior extremity. The anterior portion is slightly pointed. The general shape is ovoid with the dorsum highly convex. In older specimens the posterior region is flattened. The body is covered all over with long curved spines which are longer and more numerous towards the posterior end. The anal cleft extends to about one-fifth the length of the body. The limbs and antennae are well-developed. The anal operculum is quite prominent and darker in colour than the rest of the body. The general colour of the insect is dark brown, more or less obscured by a white powdery secretion. The stigmatic clefts are shallow, transverse grooves and are not very clearly demarked in life.

The development of ovisac and oviposition are in *P. maxima* Gr., (Ayyar, 1925). The sac attains a maximum length of 8 to 10 mm. There is a median longitudinal groove along the ovisac with two lateral ones on either side.

The Formosan species, *P. durantae* to which this species is allied, is described by Takahashi (1931) as below:—

'Adult female: Very closely related to *P. psidii* Mask., but differs from it in the following characters.

1. Marginal setae simple, not dilated nor furcated apically, nearly half the length of the longest stigmatic spine but longer than the shorter one; about 0.0277 mm. in length.

2. Legs shorter; hind femur about 0.18 mm.; hind tibia about 0.16 mm.; hind tarsus about 0.097 mm. in length.

3. The three setae arranged in a row near the base of each antenna, a little smaller.

The body of the adult female is about 3 to 4 mm. in length and is provided with many circular or sub-circular small pores over the dorsum and the abdominal and thoracic segments are defined on dorsum.

The adult female when mounted, is broadly ovate, with the anterior end pointed. The antenna is well-developed, eight-segmented. In some specimens the third segment shows a division, making the antenna nine-jointed.

The lengths of the various antennal segments of six specimens are as follows. The right antenna is taken into consideration and measurements are given in microns.

Specimens	SEGMENTS							
	1	2	3	4	5	6	7	8
I	15	17	20	13	14	8	7	10
II	16	17	21	12	15	9	8	12
III	15	16	19	11	14	7	6	11
IV	13	18	20	11	13	9	7	12
V	12	15	19	11	14	7	6	Broken
VI	14	15	20	11	14	8	7	11

The average length of antenna is 0.44 mm. The antennal formula is 3, 2, 1, 5, 4, 8, 6, 7. The third segment is the longest and the second is the stoutest and next to the third in length. The terminal segment carries four to five hairs. The stigmatic cleft is shallow and in older specimens not demarked. There are three stout spines marking the stigmal region, central one twice as long as the lateral. The spiracular opening is wide and conspicuous. There is a series of pores leading from the margin up to the stigmata. The margin of the body is fringed with slender spines. In this variety the spines are of two kinds. There are the usual spiny curved hairs intermingled with stout, dilated and furcated hairs as in *P. psidii* Mask.

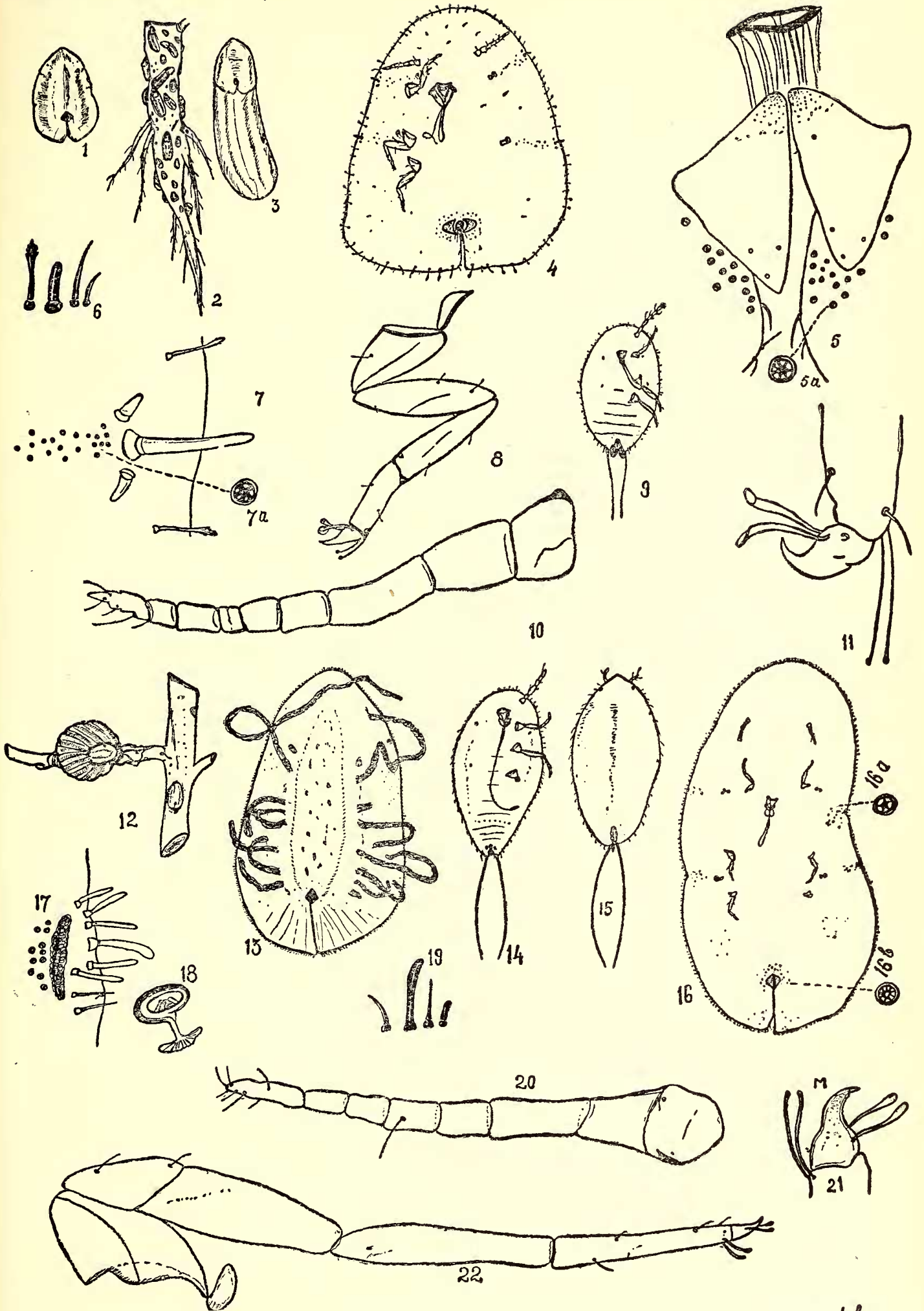
The leg is well-developed. The femur is longer than tibia; tarsus more than half the length of tibia. The claw is well-developed and curved. The tarsal digitules are short, stout and dilated distally. The unguis arise from the sides of the claw. The anal cleft extends to about one-fifth the length of the insect. The anal plates are more or less triangular, the inner side the longest. The outer angle carries a very long seta. On the distal end also there are smaller hairs. The anal region is provided with numerous multilocular pores.

*Remarks.*—This form appears to be a variety of *P. durantae* Tak., the adult female agreeing with it in possessing smaller legs and shorter setae arranged near the antennae, but differing in that some of the marginal hairs are dilated and furcated apically as in *P. psidii* Mask. This form is intermediate between *P. psidii* Mask., and *P. durantae* Tak. In external appearance and production of ovisac it resembles very much *P. psidii* Mask.

#### *Ceronema koebele* Green.

(Plates I, II; figures 12 to 28.)

This coccid was found by the writer on the branches and stems of *Caesalpinia coriaria*, a familiar tree around the Agricultural Farm, Coimbatore, during January 1934. Ayyar (1936) recorded this insect for the first time from India. It was originally described by Green (1909) from Kandy, Ceylon, on branches of

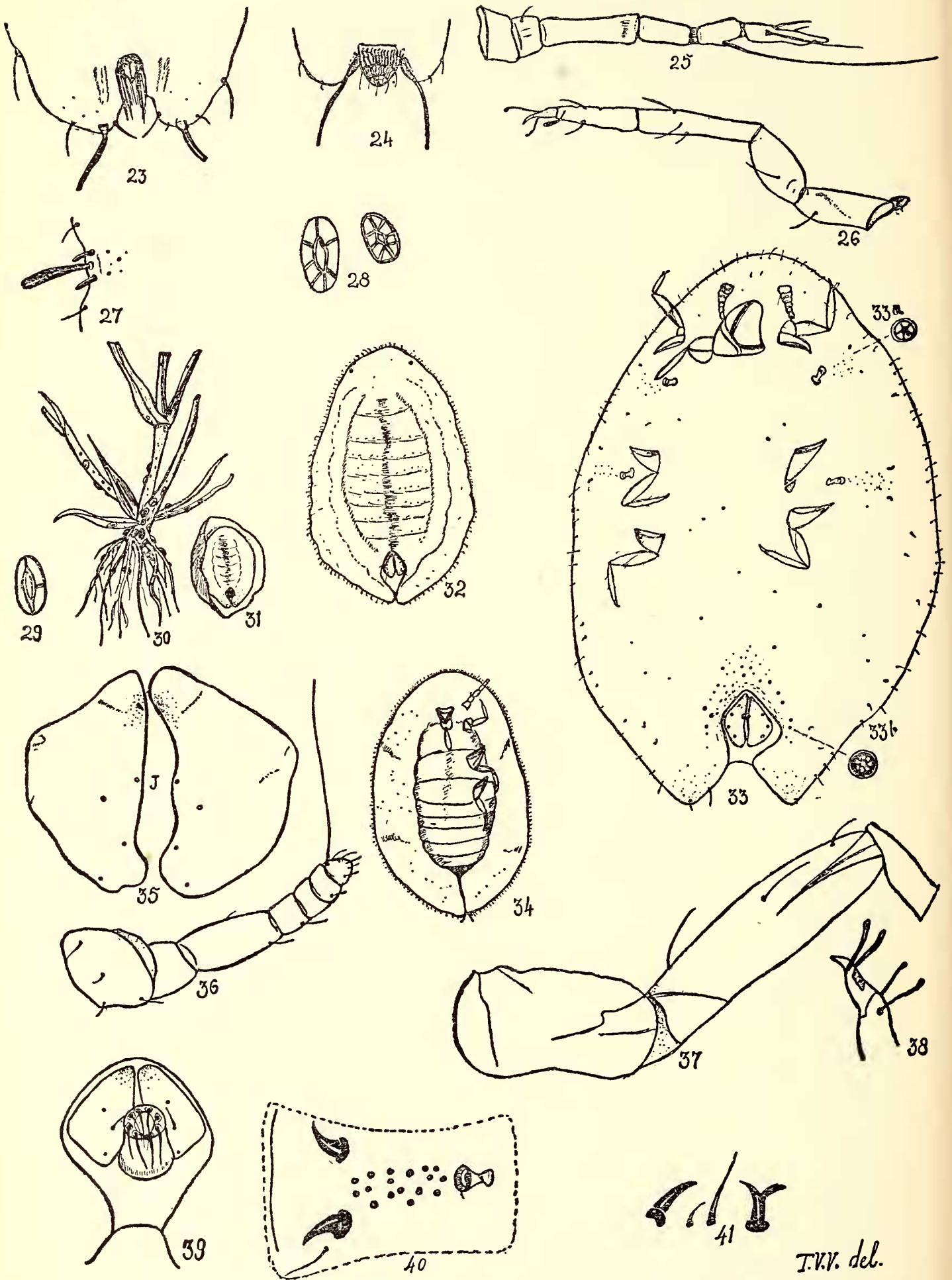


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*Sapium sebiferum* collected by Alber Koebele after whom it is named. According to Green it has never been noted as a pest in Ceylon. Rutherford (1915) has recorded it from Ceylon on the twigs of *Pithecolobium saman*.

*Description, life-history and habits.* The adult females were noted on the older branches of the tree and the freshly hatched nymphs were seen migrating slowly to the tender shoots.

The mature female insect measures from 7.5 mm. to 8.2 mm. in length and 6 mm. to 7.25 mm. in breadth. The broadest region is just behind the middle. The general shape is elongate oval, convex above, with an inconspicuous carina on the dorsum. The general colour is greenish brown. The ventral surface is slightly lighter in colour. The eyes and the anal operculum are chocolate brown in colour. The mid-dorsal area is covered with a fine coating of mealy material. The anal cleft extends to about one-sixth the length of the whole body. The anal valves are small.

The ovisac is made up of a felted buff-white secretion, secreted by special glands found on the dorsum of the insect. The ovisac is formed by the fusion of seven to eight pairs of coiled-up creamy white processes arising from either side of the dorsum. These processes spread outwards coiling and fixing themselves on the host plant. The fusion of these processes are clearly indicated on the ovisac by prominent ridges. Due to the formation of the ovisac the adult is carried up and assumes a tilted position as in the genus *Pulvinaria*. In the early adult female a crenulate line of white secretion along the sides marks the formation of the future ovisac. The margin of the body is fringed all round with stout pointed spines. The female insect, after maceration in potash agrees with Green's description. The following remarks may, however, be added to his description.

The body is broadly ovate. The derm is covered irregularly with more or less polygonal cells. The spinning glands corresponding to the ridges of the ovisac are placed round the margin of the body just dorsal to marginal spines. Anal lobes are furnished with a variable number of spinose hairs and the anal operculum is provided with eight to ten long hairs. The margin of the body is provided with a close series of pointed spines. The stigmatic clefts are furnished with ten to eleven spines each, including a large central spine and the cleft is bordered by a lunate chitinous plate. The antenna is eight-jointed; third and fourth joints apparently without any hairs and sixth with a very long hair. Legs are well-developed; foot with four digitules, dilated distally. Claw is bent strongly at the tip, and provided with a minute denticle on the inner side near the extremity.

The adult females with their eggs are found grouped together on the same branch. The ovisac under normal conditions, is fairly big and handsome. The interior of the ovisac is smooth. Each ovisac encloses numerous eggs, all beautifully and closely packed together. The number of eggs in a single ovisac was found to be 640. The eggs are greenish in colour, smooth, elongate and measures about 0.28 mm. in length. The eggs in each mass do not hatch all at the same moment, but it takes three to four days for all the nymphs in one mass to hatch out. The nymphs break through the walls of the ovisac and emerge through small slits made on the ovisac.

*The early larval stages.* The just hatched larva, which is a fairly active creature, is elliptical and reddish in colour. It bears a pair of caudal setae as long as the body. The margin of the body is fringed with fine curved hairs. The antennae and legs are well-developed. The antenna consists of six segments the third segment is longest and the fifth carries a very long seta. The fifth and terminal segments show traces of segmentation. The anogenital ring is provided with six stout hairs. Length 0.72 mm., breadth 0.6 mm.

The just hatched larva after moving about for some time near to its birth place, migrates slowly to a favourable spot and settles down to feed. The nymphs are restless only for five or six days after which they permanently settle down on the food plant. The nymphs are very slow in developing. They moult thrice before they attain the adult stage. In the process of moulting the whole outer covering is involved including the rostral apparatus and anal plates.

Although the male puparia were found in large numbers adult males could not be noticed.

The female insect is clearly marked out in the second stage; the insect grows broader and the waxy spots appear on the dorsum. The life-cycle is found to occupy 95 to 100 days.

*Natural enemies.*—A few adult coccinellids, *Scymnus coccivora* Ramakrishna, were found feeding inside the eggsacs.

### *Lecanopsis ceylonica* Green.

(Plates II and III; figures 29 to 53.)

These insects were collected by the writer on the roots of grass in Coimbatore during April 1934. They were mostly found on the roots of grass covered by stones or pebbles. Green (1922) first described the species collected from Ceylon, 'at the base of a grass plant, below a large stone'. It is clear that these insects require a cool and shady place to thrive well. This is the first record of this insect from India.

*The nature of the damage done by the insect.*—A number of adult females with conspicuous eggsacs were revealed on removing a few stones, mostly attached to the lower sheathing base of the stem and roots of the grass. They were noted in all stages and generally the mature females selected the broad blades of the grass for oviposition. The attack spreads rapidly all over the place and the plants dry up. The young nymphs are very active, crawling over long distances in search of a suitable place. A species of black ant visits them in large numbers to feed on the honeydew secreted by the maturing female. The ants sometimes go under the soil in search of the sweet sugary fluid.

*Description, life-history and habits.*—On grasses which are pretty badly infested with the scale, almost all the different stages can be noted at any time.

The mature female, just before it develops the ovisac measures from 3.0 to 3.5 mm. in length and 1.5 to 1.7 mm. in breadth; more or less ovate, broadest portion near the posterior end. The derm is highly convex and the insect is partially surrounded by a white felted test.

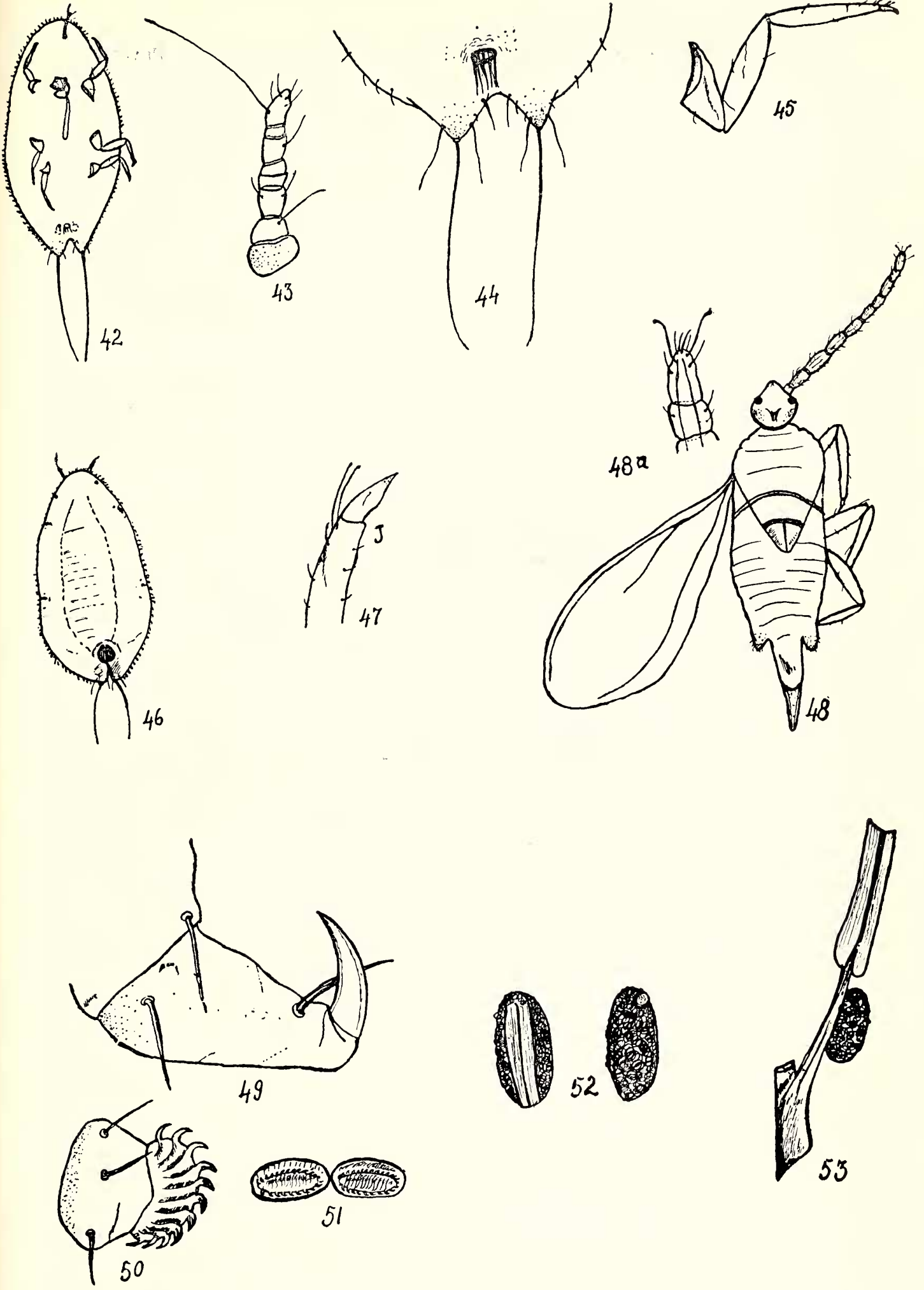
Specimens collected by the writer are larger than the Ceylonese form and are very closely pitted on the dorsum.

The antenna is six-segmented, without any trace of further segmentation. The 6th segment carries a very long lateral seta which is longer than the antenna itself. Antennal formula may be noted down as 3, 2, 1, 6, (5, 4). Measurements of the right antennal segments of 6 adults are as below: (Measurements in microns).

Adults	SEGMENTS					
	I	II	III	IV	V	VI
1	8	9	20	5	6	7
2	8	10	21	5	5	6
3	7	9	20	5	6	7
4	7	10	19	5	5	6
5	8	11	22	6	6	8
6	6	9	21	6	6	8

Legs well developed, 2.7 mm. in length with the tibiotarsal articulation sub-obsolete. Tarsus is about half the length of tibia. Tarsal digitules slender, long and knobbed. The unguinal digitules are dilated. Anal plates surrounded





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